Route to:

Return to:

# INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

CHICAGO 16, ILLINOIS

# GAS ABSTRACTS

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# CONTENTS


1. Gas Industry ..... 21

2. Appliances, Domestic ..... 22

3. Combustion: Commercial and Industrial Furnaces ..... 22

4. Gasification: Carbonization: Natural Gas Substitutes ..... 24

5. Natural Gas and Natural Gas Condensates ..... 26
   A. Production and Processing:
   B. Compression and Transmission:
   C. Distribution

6. Petroleum and Synthetic Liquid Fuels ..... 31

7. Analytical Methods and Tests ..... 32

8. General and Physical Chemistry ..... 33

9. Organic Chemistry: Petrochemicals ..... 34

10. Chemical Engineering ..... 35

11. Process Equipment and Instrumentation ..... 37

12. Materials of Construction: Corrosion ..... 38

13. New Books ..... 40



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# 1. GAS INDUSTRY

## Industrial Hazards

Hammond, J. W. NOW THEY'RE BLUEPRINTING INDUSTRIAL HYGIENE. *Oil Gas J.*, 54, 207, 210, 214 (1955) November 21.

Industrial hygiene is of necessity a dynamic field because of the growing variety of processes and materials in modern industry. Prevention of disease, or loss of human efficiency require full study by the physician, the industrial-hygiene engineer and the chemist of the environmental factors which influence health. Accumulated experience in engineering control of occupational hazards has advanced to a point where it may be "built into" the new plant as a prevention measure by the designer. In this respect the petroleum industry is now profiting from the earlier experience of other industries.

O. P. Brysch

## Northwest Progress

TOUR OF CONSTRUCTION SITES SHOWS PIPELINE PROGRESS TO EXECUTIVES FROM THE PACIFIC NORTHWEST. *Gas*, 31, 126, 128 (1955) November.

A brief description of an inspection tour of the progress being made on the construction of facilities for the Pacific Northwest Pipeline Corporation to be used in transporting natural gas to the Pacific Northwest. G. G. Wilson

## Nuclear Bomb Effects

Corfield, G. GAS AND THE ATOM BLAST. *Gas Age*, 116, 37-39 (1955) November 3; *Amer. Gas Assoc. Monthly*, 37, 14-16, 22 (1955) November.

A condensation is given of the preliminary report written for and issued by Federal Civil Defense Administration under the title "Effects of a Nuclear Explosion on Typical Natural and Manufactured Gas Underground and Aboveground Installations, Including Appliances in Houses." Copies of this FCDA preliminary report are not available at this time for distribution to the gas industry. It is expected that, after careful review of the data and of information from related projects which may result in some revisions and additions, this preliminary report will be reprinted and issued in final form; it is not known at this time when or if copies of the final report will be available for general distribution to the Gas Industry.

Author's Abstract

## Ratable Gas Take

RATABLE GAS TAKE COMING. *Oil Gas J.*, 54, 88 (1955) October 17.

Ratable gas take and posted field prices for gas were predicted as the goal of the Texas Railroad Commission by its chairman, W. J. Murray, Jr. Quick action and a blanket order for proportionate production among wells in a field, and among fields is prevented by present complications of natural gas marketing. Varying prices paid within a field, and conflicts between the gas-sales contract and the field-proration formula are the principal blocks, but the commission is slowly applying the plan (as in the Henze field), first to fields served by a single pipeline, and ultimately to multi-line fields.

O. P. Brysch

## Research Costs

Hussey, R. A. and Tiffany, H. T. RESEARCH COSTS. *Research and Engrg.*, 1, 34-7 (1955) November.

A method of cost accounting is presented which may be used to determine the actual cost of carrying out a given investigation in company research laboratories. R. T. Ellington

## Supply Problems

Kayser, P. PROBLEMS AND PROSPECTS OF GAS SUPPLY. *Public Utilities Fortn.*, 56, 921-28 (1955) December 8.

The economic position of natural gas as a natural energy resource is reviewed in the light of present day competition of fuels and of domestic demand. Gas prices, whether regulated or not, must be sufficient to stimulate aggressive exploration. Because of the growing demand, and because pipelines are the cheapest method of fuel transportation, synthesis plants located at coal-mines would appear to be the most likely prospect for a future supply. O. P. Brysch

## Trans-Canada Line

FINAL CANADIAN OBSTACLE TO TRANS-CANADA LINE REMOVED BY NEW ACCORD. *Pipe Line News*, 27, 18-19 (1955) November.

An agreement reached by Canadian Prime Min-

ister St. Laurent with Premier Frost of Ontario to establish a joint Crown Company to build the portion of the Trans-Canada line from the Manitoba border to Toronto has removed one of the major obstacles to the construction of an all Canadian Trans-Canada Pipeline. A map of the pipeline route and construction schedule is included. G. G. Wilson

Dock, W. L. ONTARIO PROPOSES NEW PLAN FOR CANADIAN GAS LINE. *World Petroleum*, **26**, 72-73 (1955) November.

Two new financing proposals have been made to try and get the Trans-Canada gas pipeline under construction. These plans, and the opposition to them, are presented. B. E. Eakin

## 2. APPLIANCES

### Clothes Dryer Sales

Reitan, E. H. HOW I SELL GAS CLOTHES DRYERS. *Butane-Propane News*, **17**, 50, 52, 54 (1955) November.

Demonstrations are the key to successful dryer sales . . . and don't be afraid to demonstrate an electric washer; in fact, demonstrate and sell them as a pair. That's the sound advice of an eminently successful gas clothes dryer dealer from the Middle West. Author's Abstract

### Combustion Air

McPherson, H. L. FOR PROPER BURNER OPERATION PROVIDE ADEQUATE AIR. *Gas Heat*, **6**, 37-39 (1955) November.

An engineer of the American Gas Association Laboratories tells why and how to provide adequate air for combustion, ventilation, and dilution of flue gases. R. T. Ellington

### Fuel Costs

McCracken, E. C. and Beveridge, E. COST OF ELECTRICITY AND LIQUEFIED PETROLEUM GAS. Agriculture Informn. Bull. No. 141 (1955) August.

This bulletin covers the long-disputed Beltsville, Md., tests. As in many such tests results are reported on the basis of energy consumption rather than performance and economy. All sales personnel should study this report.
R. T. Ellington

### High Temperature Water

Lieberg, O. S. HIGH TEMPERATURE WATER. PART III. PIPING AND DISTRIBUTION DESIGN. Air Conditng, Heatng, Ventilng, **52**, 86-90 (1955) November.

One of the principal advantages of high temperature water is the simplicity with which it can be distributed. Engineering data is presented for many types of applications. [See also *Gas Abs*, **11**, 210 (1955)]
R. T. Ellington

### Space Heating

BASEMENTLESS HOUSE HEATING. *Gas Heat*, **6**, 32, 33, 74, 75 (1955) November.

Temperature distribution, a frequent problem in the satisfactory use of wall heaters, has been traced by tests in the National Bureau of Standards test bungalow under the sponsorship of the Federal Housing Administration. A single gasfired wall heater was centrally located in the four-room house and acceptability of this type of heating was investigated. The observed and computed heat loss values were compared to see if the capacity rating of such a system should be reduced when the wall heater is located on the living level of a one-story, basementless house. Author's Abstract

## 3. COMBUSTION AND INDUSTRIAL FURNACES

### Air Pollution

Faith, W. L., Hitchcock, L. B., Neiburger, M., Renzetti, N. A., Rogers, L. H. SECOND TECHNICAL PROGRESS REPORT. Air Pollution Foundation, **1**, No. 12, pp. 1-143, Los Angeles (1955) November 1.

This report presents the information obtained during 1954 and 55 on the analysis of smog, the mechanism of its formation, sources of smog, and ways in which it may be controlled.
R. T. Ellington

Hawkins, J. E., Nonhebel, G. CHIMNEYS AND THE DISPERSAL OF SMOKE. *J. Inst. Fuel* (British) **28**, 530-45 (1955) November.

To avoid parts of a smoke plume being blown rapidly to ground by local disturbances of the

wind, it is necessary to choose minimum heights of chimney and exit velocities of flue gases which are related to the height of surrounding buildings, diameter of chimney and local ground contours. Even when the smoke avoids these disturbances, part of it, considerably diluted, reaches the ground at distances beyond about 6 times the effective height of the chimney. This effective height is the sum of the actual height and a function of the temperature, volume and velocity of the gases at the mouth of the chimney. Theoretical formulae which have been developed for the calculation of smoke concentration at ground level at any distance from the chimney and the rate of dust and grit deposition are discussed in this paper and presented in a form suitable for use by design engineers, together with the supporting evidence from direct measurements. The agreement is sufficiently good for most design purposes. The meteorological background of the problem is described in an appendix.

Authors' Abstract

CLEAN AIR BILL: SECOND READING. *Gas World* (British), **142**, 1220-21 (1955) November 12.

A discussion of the Clean Air Bill which has been introduced to the British House of Commons, is presented. The Bill is designed to reduce air pollution primarily from coal burning equipment. D. V. Kniebes

## Dust Removal

CORRECT POWER SUPPLY: KEY TO EFFICIENT ELECTROSTATIC-PRECIPITATOR FLYASH COLLECTION. *Power*, **99**, 85-87 (1955) September.

The author discusses the requirements of power-rectifier equipment for electrostatic precipitators, and stresses the importance of proper balance between power supply and load in the design of the precipitator which must be maintained by equating the unit correctly for efficient flyash collection. Advantages of the operation of the electron tube type over that of the mechanical type are revealed. S. Volchko

## Fire Safety

Bond, H. FIRE RESEARCH—PART I. *Nat. Fire Protn. Assoc.*, **49**, 115-151 (1955) October.

This report covers the activities of various organizations of which almost all are members of the National Fire Protection Association and are engaged in projects which come within the meaning of the term "fire research."

S. Volchko

## Flame Research

Gordon, A. S. and Knipe, R. H. THE EXPLOSIVE REACTION OF CARBON MONOXIDE AND OXYGEN AT THE SECOND EXPLOSION LIMIT IN QUARTZ VESSELS. *J. Phys. Chem.*, **59**, 1160-65 (1955) November.

The second explosion limits of the one-CO: two-$O_2$ mixture was studied using pure and dry gases. In agreement with other investigations water vapor was found to increase the limits. On the basis of a review of previous work, a mechanism is proposed and its reasonableness discussed. S. A. Weil

Knipe, R. H. and Gordon, A. S. SPECTRUM OF CARBON MONOXIDE-OXYGEN EXPLOSION. I. THE VISIBLE SPECTRUM. *J. Chem. Phys.*, **23**, 2097-2101 (1955) November.

The existence of an absorption band in the spectrum of dry CO-$O_2$ explosions is ascribed to an electronically excited state of CO. Possible reaction paths leading to this species are presented. S. A. Weil

Vanpée, M. and Girard, F. FORMALDEHYDE AND THE OXIDATION OF METHANE. *Fuel* (British), **34**, 433-43 (1955) October.

The effect of adding formaldehyde to the reaction of methane and oxygen was studied at ca. 500° C. The results are in agreement with the concept that $H_2CO$ is an intermediate in the $CH_4$-$O_2$ reaction. Since the decomposition of $H_2CO$ occurs more rapidly in the presence of reacted methane, the $H_2CO$ oxidation is catalyzed by intermediates in the combustion of $CH_4$. Evidence is offered of the occurrence of cool flames when small amounts of $H_2CO$ are added to reacting $CH_4$-$O_2$ systems. Ignition can be induced by the addition of $H_2CO$ at temperatures and pressures well below the natural flammability limits. S. A. Weil

## $H_2S$ in Flames

Kurz, P. F. INFLUENCE OF HYDROGEN SULFIDE ON BLOW-OFF LIMITS OF HY-

DROCARBON FLAMES. *Fuel* (British) 463-470 (1955) October.

The addition of $H_2S$ to hydrocarbon fuels decreases the blow-off limit. No general rule for mixtures was found to be applicable to hydrocarbon-$H_2S$ mixtures. Of the fuels studied, ethylene was the most sensitive to the presence of $H_2S$, the blow-off limit decreasing about 10% in permissable stream velocity when 6% $H_2S$ is added to the $C_2H_4$-air mixture.

S. A. Weil

### Industrial Heating

Smith, A. Q. REVOLUTION IN SOUTHERN CALIFORNIA. *Gas Age*, 116, 37-46 (1955) October 6; *Indust. Gas*, 34, 3-12, (1955) December.

Some of the applications and equipment in which gas is used in Southern California manufacturing are described as follows: Gladding McBean Co.,—fine china; Lever Brothers,—steam generation, soap and detergent drying, generation of hydrogen, and employees cafeteria; Crane-Pacific,—ceramic household appliances; Sascha Brastoff Products, Inc.—ceramic specialties; Hazel-Atlas Glass Co.,—annealing glass containers; Santa Anita Potteries—Pottery; Graffers and Sattlers,—gas ranges, core baking oven; United Piece Dye Works,—textile finishing. J. R. Hasenberg

Cubbage, P. A. and Simonds, W. A. AN INVESTIGATION OF EXPLOSION RELIEFS FOR INDUSTRIAL DRYING OVENS. *Gas World*, (British) 142, 1380-83 (1955) November 26.

Methods are presented for designing adequate pressure reliefs that do not in themselves become sources of danger. R. T. Ellington

### Nuclear Power

Lane, J. A. ECONOMICS OF NUCLEAR POWER. *Research and Eng.*, 1, 22-27 (1955) October-November.

The economics of nuclear power are analysed thoroughly. Nuclear power at a cost of 5 mil/kwh seems to be reasonable and if the anticipated advantages of nuclear power plant are proven by practice then nuclear power costs will compete with present fuels.

W. G. Bair

Thompson, A. G. BRITISH RESEARCH ON THE NUCLEAR METALS. *Can. Chem. Processing*, 39, 125, 126, 128, 130 (1955) September.
The Atomic Energy Authority (United Kingdom) is accelerating the development of materials for the construction and operation of nuclear reactors. Laboratories are conducting research to solve problems of various types of reactors that often have a common basis; as compatability of materials, winning of selected metals, physical metallurgy of alloys, and deformation of metals both in fabrication and under irradiation. A. J. Tulis

## 4. CARBONIZATION AND GASIFICATION

### Coal Properties

Dryden, I. G. CALORIFIC VALUE AND THE CHEMICAL CONSTITUTION OF COAL. *Fuel*, (British) 34, S36-47 (1955) April (Suppl.)
A statistical analysis has shown that the calorific value of coals can be predicted from a study of ring condensation index determined according to Van Krevelen's method. Advantages of this method over that based on densities are discussed. K. C. Channabasappa

Dryden, I. G. RELATIONSHIP BETWEEN SOME PHYSICAL PROPERTIES OF COALS AND THEIR CHEMICAL STRUCTURE—FURTHER COMMENT AND AN APPRAISAL. *Fuel* (British), 34, S48-53, (1955) April (Suppl.)
A review of recent literature on the relationship between the physical properties of coals and their chemical structure is presented and the results obtained from this study are compared with those from X-ray diffraction studies. A brief discussion on the relationship to coal structure of molecular refractivity, volatile matter and maximum density is included.

K. C. Channabasappa

Van Der Sommen, J., Zwietering, P., Eillebrecht, B. J. and Van Krevelen, D. W. CHEMICAL STRUCTURE AND PROPERTIES OF COAL. XII—SORPTION CAPACITY FOR METHANE. *Fuel* (British), 34, 444-48 (1955) October.

A new apparatus is described which permits accurate measurement of the adsorption of gas-

es on solid adsorbents at high pressure. The apparatus consists of an adsorption vessel connected on one side to a glass buret having four calibrated bulbs joined by small capillaries into which platinum contacts are sealed; and molybdenum wire resistances and a Wheatstone bridge are joined to the contacts. The vessel is linked on the other side to a high-vacuum line and through a filling train consisting of a high-pressure cylinder containing pure methane. Data are given for the sorption isotherm up to 500 atmospheres of methane on coal, used for kinetic studies to be described in a later paper. The saturation value for methane is in good agreement with the value of the area of ultrafine pores of the coal determined earlier from low-pressure isotherms. K. C. Channabasappa

## Coke Properties

Inouye, K. and Toni, H. STRUCTURE OF COKE: I—STRUCTURE AND PROPERTIES OF A BLAST FURNACE COKE; Inouye, K. and Roppongi, A.: II—PHYSICAL PROPERTIES OF COKES PRODUCED FROM VARIOUS BLENDED SLACKS. *Fuel* (British), 34, 356-62 (1955) July; 471-79 (1955) October.

Industrial and experimental blast-furnace cokes prepared from various blends of coals, chars and tar at 1150° C. and 24 hours, were investigated intensively for physical characteristics,—drum-test strength, elastic modulus, electrical resistivity (block and powder), pore dimension, X-ray crystallite structure, wet oxidation and surface area by iodine adsorption. Sample pieces, sliced into 5 sections, progressing inward from the oven-wall end, showed a cell-wall character indicating that a similar structural unit existed throughout. The agglomerates composed of these units then determine the properties and structure of the coke, and are dependent on carbonizing conditions.

O. P. Brysch

## Coking Tests

Echterhoff, H. NEUE METHODEN ZUR BEURTEILUNG DER VERKOKBARKEIT VON KOHLEN. (NEW METHODS FOR THE EVALUATION OF THE COKING QUALITY OF COALS.) *Erdoel und Kohle* (German), 8, 294-98 (1955) May.

Two new apparatuses used by the Steinkohlenbergbauverein, Essen, for evaluation of coking characteristics of different coals are described. A detecting and recording apparatus, which shows on a drum-chart the course of degasification of a coal sample, is based on the conditinuous detection of weight-loss. Also, the degree of contraction and expansion that occur when coals are thermally treated is measured and recorded by another automatic electric plastometer apparatus of plunger type. Results with a number of coals are compared. Its advantages over those of other dilatometer and plastometer tests are discussed.

K. C. Channabasappa

Prostel, E. and Rice, N. FRACTIONAL CARBONIZATION OF WYOMING NONCOKING COALS. *Ind. Eng. Chem.*, 47, 2317-21 (1955) November.

Carbonization of Wyoming noncoking coals will depend on economic use of all products, especially the primary tars and the high-hydrogen gas. An assay method was developed to determine the possible yields and properties of products. Results for 8 Wyoming coals are reported in detail. Tar evolution occurs chiefly between 752° to 935° F., also 50 percent of the gases are evolved below 1202° F. A 300 lb/day pilot retort is described. O. P. Brysch

## Hydrocarbon Gasification

[Linden, H. R.] HIGH TEMPERATURE, VAPOR-PHASE CRACKING OF HYDROCARBONS. *Ind. Eng. Chem.*, 47, 2467-69 (1955) December.

To permit the prediction of gaseous product distribution in the production of fuel gases, gaseous olefins, aromatics, acetylene and other valuable products by high temperature, vapor-phase cracking of natural gas liquids, petroleum oils and shale oils, a more quantitative knowledge of the factors controlling the behavior of these complex reaction systems is necessary. This article reports the general aspects of thermal vapor-phase cracking covered in the three subsequent papers by Institute of Gas Technology staff members on production of fuel gases and crude petrochemicals. The problem, apparatus and procedure are described and a 52-item combined bibliography is given.

O. P. Brysch

Linden, H. R., Brooks, C. E., and Miller, L. N. PRODUCTION OF NATURAL GAS SUBSTITUTES BY THERMAL CRACKING OF NATURAL GAS LIQUIDS. *Ind. Eng. Chem.*, 47, 2475-78 (1955) December.

Vapor-phase, thermal cracking of propane, butane and natural gasoline is shown to be a practical method for producing natural gas substitutes. At the more severe cracking conditions, and at three atmospheres gasfication pressure, the product gases approach complete substitutability for natural gas on atmospheric gas burners. Significant yields of valuable aromatics are also obtained. Authors' Abstract

Linden, H. R. and Peck, R. E. GASEOUS PRODUCT DISTRIBUTION IN HYDROCARBON PYROLYSIS. *Ind. Eng. Chem.*, 47, 2470-74 (1955) December.

It is demonstrated that upon pyrolysis of hydrocarbons from propane to Bunker "C" fuel oils above reaction temperatures of 1300° F. and reaction times above one second, the gaseous product distribution is determined by thermodynamic and kinetic factors which are independent of feed composition. Apparent equilibria between acetylene, ethylene, hydrogen, and ethane are shown to exist for this wide range of feed hydrocarbons and cracking conditions. A reaction system based on these equilibria and on a paraffin hydrogenolysis step is used for development of a generalized method for estimating gaseous product distribution.

Authors' Abstract

Schultz, E. B., Jr., Guyer, J. J. and Linden, H. R. PYROLYSIS OF CRUDE SHALE OIL. *Ind. Eng. Chem.*, 47, 2479-82 (1955) December.

Green River shale oils when cracked at atmospheric pressure, temperatures from 1400° to 1550° F. and reaction times from one to 4.5 seconds form approximately 50 weight percent of gaseous products, and one to eleven weight percent of carbon, with the remainder consisting primarily of liquid aromatics and pitch. These yields, and the composition of the gaseous products, are shown to be very similar to those obtained from petroleum oils of equal carbon-hydrogen weight ratio. Authors' Abstract

# 5. NATURAL GAS AND NATURAL GAS CONDENSATES

## Automatic Well Operation

Meyers, D. C. HOW SHELL DESIGNS AN AUTOMATIC LEASE. *Oil Gas J.*, 54, 111-17 (1955) October 17.

From time-and-motion studies made on the lease operator, Shell decided that most of the operations could be made automatic. A pilot installation utilizing automatic controls was therefore made, consisting of: 1) time-cycle controls from a central point for 5 flowing wells, 2) automatic tank control, 3) recording of physical properties of the crude, and 4) safety devices in event of power failure or control malfunction. These operations, discussed in considerable detail in this article, have proven so successful that an entire field is now being equipped for automatic control.

B. E. Eakin

## Calorific Control

Araki, S. AUTOMATIC CONTROL OF CALORIFIC VALUE OF TOWN GAS. IGU/26-55 International Gas Union, 6th Conference New York (1955).

The attempt to control calorific value automatically with a view toward quality control of gas was made. Success was achieved by the combined use of a Junkers calorimeter with a controller manufactured by the Yokokawa Electric Works. By this device it has become possible to store high calorific gas in holders, and dilute it to a desired standard calorific value at their outlets automatically. This, incidentally, means an increase of the capacities of holders with a great economical benefit. It gives pleasure to have this opportunity to introduce the basic principle of our device and to report the results obtained at the Senju and the Omori Works of the Tokyo Gas Company. Author's Abstract

## Compressibility Factors

Griffith, E. R. COMPUTER PREPARES TABLES OF SUPERCOMPRESSIBILITY FACTORS. *Gas*, 31, 90-92 (1955) October.

The 4000 tables of supercompressibility factors recently published by the AGA were calculated

in record time by use of Univac, an electronic digital computer built by Remington Rand. The tables were computed and tabulated by the machine in a form suitable for photo-offset printing, eliminating the possibility of human errors in copying. B. E. Eakin

Rowlinson, J. S. THE REDUCED EQUATION OF STATE. *Faraday Soc. Trans.* (British), 51, 1317-26 (1955) October.

A method is given for calculating the compressibility factor of non-polar or weakly polar substances which obey equations of state different than the inert gases, if the vapor pressure of the substance is known up to the critical point. The method is based on reduced temperature and reduced density as the two parameters, and is generally accurate to about 1% near the critical density. A table of compressibility factor, z, for the inert gases, is given.

B. E. Eakin

## Condensate Removal

Campbell, J. M. STABILIZATION OF SEPARATOR LIQUID. *Oil Gas J.*, 54, 120; 122-23; 126; 128 (1955) September 12.

The use of field stabilizers of separator liquids before storing stock-tank oil results in reduced loss of the salable components and a more easily handled liquid. Stabilizer designs and their operation are discussed. B. E. Eakin

Campbell, J. M. ELEMENTS OF FIELD PROCESSING — HOW TO SAMPLE SEPARATOR FLUIDS. *Oil Gas J.*, 54, 95, 97, 99-100 (1955) October 31.

Proper determination of separator operating conditions is dependent on well-stream analysis. The well-stream analysis in turn is dependent on the sampling technique. Some of the sources of trouble in sampling, and the recommended procedure and data required are discussed.

B. E. Eakin

## Distribution Techniques

Copp, A. D. NEW ASPECTS OF DISTRIBUTION TECHNIQUE. *Gas J.* (British), 284, 321, 2, 27-29, November 2; 383-86 (1955) November 9.

A description of new operating and piping methods used by the North Thames Gas Board including experience with the use of galvanic anodes and rectifier and ground bed installations to prevent corrosion of gas distribution systems, use of wick-type vaporizers to odorize gas with calodorant C, the use of hydrogen and halogen gas leak detectors, and experience in the use of line pack in large diameter pipelines to meet peak load requirements. G. G. Wilson

## Drilling

Fischer, A. O. HOW SLIM CAN A SLIM HOLE BE? *Oil Gas J.*, 54, 131-32 (1955) October 17.

The economics of slim-hole drilling and production are outlined. If artificial lift is the limiting factor, present indications are that casing can be reduced to 2½ or even 2 inches.

B. E. Eakin

Fraser, J. R. MUD RATE AND WEIGHT LOGGING PROMISES GAS SAND EVALUATION. PART I: INTRODUCTION, PART II: DERIVATIONS, PART III: EXAMPLE. *World Oil*, 141, 137-43, 150 (1955) October.

Present geological techniques are overlooking one of the indications of the existence and quantity of gas sands penetrated by rotary drilling. Surface measurements of the mud rate and weight should provide unique clues to the existence of gas-bearing sands being penetrated and should assist in their evaluation. The mathematical and physical relations are developed to describe the behavior of the gas- and mud plug as it rises through the annulus and is discharged at the surface. A hypothetical problem in calculating the rates of annulus discharge is solved as an illustrative problem for this technique.

B. E. Eakin

WHY WAS MY WELL DRY? PROPER INTERPRETATION OF GEOLOGICAL DATA. *Oil Gas J.*, 54, 143-147 (1955) November 14.

A few hours checking the validity of the geological data may eliminate a dry hole. Test possible shallow zones thoroughly. Check these and other factors listed for possible prevention of a dry hole by geological means.

Editor's Abstract

WHY WAS MY WELL DRY? CHECK GEOPHYSICAL PITFALLS. *Oil Gas J.*, 54, 148-151 (1955) November 14.

Tie all geological and seismic data together.

Check field techniques. Make seismic interpretations based on thorough knowledge of local or regional geology. Article lists these and other factors in detail. Editor's Abstract

## Engine Developments

Bates, G. O., English, J. E. and Franklin, G. M. EBULLITION COOLING IS PAYING OFF. *Pipe Line Ind.*, 3, 20-23 (1955) November.

By letting water boil in the engine jackets, cooling equipment is less costly, the engine operates at a higher and less variable temperature, and the efficiency is increased. Here is the operating experience of a company which has been using this type of cooling for some time.
Authors' Abstract

Warner, W. E. THE TURBO-CHARGED HORIZONTAL GAS ENGINE. *Petroleum Eng.*, 27, D42-50 (1955) November.

The author feels few engines will equal turbocharged horizontal engine for dependability and low maintenance costs. R. T. Ellington

## Equipment Standards

Suman, J. R. THIRTY YEARS OF A.P.I. STANDARDS. *Oil Gas J.*, 54, 217-22 (1955) November 21.

Since 1923 API Committees consisting of user and manufacturer representatives have worked on development of standards and specifications for oil field equipment. Goals have been the simplification of sizes, interchangeability between working parts, specifications to control the quality and grade of material, and maintenance of interchangeability between products of different manufacturers. Success of the program is shown by the acceptance of the standards both domestically and internationally and by the monetary savings which can be attributed to their use. D. M. Mason

## Flow Measurement

Smith, F. C., Jr. ANALOG COMPUTER RECORDS FLOW. *Petroleum Refiner*, 34, 173-75 (1955) October.

Instantaneous flow measurements and direct and continuous recordings of flow calculations by the use of an analog computer can greatly increase the accuracy and speed of the results and eliminate possible human errors in the computing process. The advantages of continuous simultaneous computation and the applications of the computer to pipe lines are discussed. S. Hu

## Fracturing

Wilson, G. M. DRAIN HOLE FRACTURING IS STIMULATING WELLS. *World Oil*, 141, 145-46 (1955) November.

Production can be increased by 50 to 100 percent with combined drain drilling and fracturing. Author's Abstract

UNUSUAL FRACTURE TECHNIQUE STIMULATES NEW MEXICO DRY GAS WELLS. *Petroleum Eng.*, 27, B1110-11 (1955) November.

Good results have been obtained and a considerable savings in treatment costs by using 40,000 gallons of untreated river water and 60,000 pounds of Arizona 20-40 mesh sand for fracturing. The process, locally called "river-proc" has proven highly successful, resulting in an average 10 fold increase in open flow potential.
B. E. Eakin

## Hydrocarbon Adsorption

Bratzler, K., and Engelhardt, A. (assigned to Laboratorium f. Adsorptionstechnik) PROCESS FOR THE SEPARATION OF HYDROCARBONS FROM GASEOUS MIXTURES BY ADSORPTION. U. S. 2,722,999 (1955) November 8.

This invention relates to new methods by which hydrocarbons of low boiling point may be separately obtained from gaseous mixtures by adsorption in a continuous process. The gas mixture to be separated is passed through one or more adsorbers containing a static layer of an adsorption means. The material to be recovered is taken up by the adsorption means and the gas mixture is passed through until its adsorptive power is exhausted, i. e. until the adsorption means is saturated. Hereupon the adsorber is removed from the gas stream and replaced by fresh adsorber. While the fresh adsorber is being charged in the manner described heretofore, the charged adsorption means of the first adsorber is freed of the adsorbed material by steaming or in another suitable manner. In this way, the adsorbers are alternately charged

and regenerated. It is the object of this invention to eliminate the disadvantages of the known processes and to provide a method in which the separation of low boiling point hydrocarbons is improved and better yields are obtained. Inventors' Abstract

## Internal Line Coating

Kirwan, K. K., and Perkins, A. G. (assigned to Centriline Corp.) REMOTELY CONTROLLED PIPE LINING APPARATUS. U. S. 2,704,873 (1955) March 29.

A device for applying lining material such as cement mortar to the interior wall surfaces of pipelines is described. This remotely controlled device uniformly distributes mortar onto the pipe surface and smooths it into place with a rotatable trowel while traveling through the pipe. G. G. Wilson

Taylor, D. M. BIG PIPE WITH SLICK INSIDE PAYS OFF. *Pipe Line Ind.*, 3, 40-46, 60-62 (1955) October.

An illustrated summary of innovations incorporated in the construction and design of pipelines laid during Transco's recently completed expansion program. Experience obtained with internally coated pipe indicates that it will greatly reduce cleaning and drying problems after hydrostatic testing. G. G. Wilson

## Line Construction

Deering, R. G. FOUR TECHNIQUES INSURE A BETTER PIPELINE. *Oil Gas J.*, 54, 118-20 (1955) October 17.

Some unusual practices used in the design and construction of a 140-mile, 22-inch gas pipeline are noted. These practices include the use of higher strength pipe (A.P.I. Grade x-52), optimum location of casing vents, careful coating and handling procedures, and a high percentage of weld x-rays. G. G. Wilson

## Logging

Hamilton, R. W. WHERE TO USE WELL LOGS—AND WHAT THEY TELL YOU . . .; Tittle, C. W. and Wyllie, M. R. RADIOACTIVITY OF NUCLEAR LOGS. *Oil Gas J.*, 54, 158-166 (1955) November 21.

A review is presented of the various logging methods that are available to the industry. The control of conditions in the well, and where and when each type of log can be of most value, are discussed. A table is included indicating where to use well logs and what they will tell you.
B. E. Eakin

## Offshore Techniques

Reilly, J. DRILLING IN DEEP, DEEP WATER. *Oil Gas J.*, 54, 8083 (1955) September 12.

The trend in off-shore drilling is to deeper and deeper water. Present demand of the oil industry is for structures for drilling in 100 feet of water, and over. The designs which have been proposed to meet this challenge are unique. Recent designs are discussed. B. E. Eakin

## Permeability

Hutta, J. J. and Griffiths, J. C. DIRECTIONAL PERMEABILITY OF SANDSTONES: A TEST OF TECHNIQUE. *Producers Monthly*, 19, 24-31 (1955) October.

The objective of this investigation was to test the reliability of permeability measurements. The technique utilized was very sensitive and could detect small changes in flow rate. Some of the cores tested showed a distinct directional permeability pattern and others did not. One interesting development of these tests is that directional pattern tended to persist through variation in cement content, and change in gram size. This would indicate that fabric of the core is independent of the textural and at least some of the compositional elements of the rock.
B. E. Eakin

Harmsen, G. J. THE CONCEPT "HYDRAULIC RADIUS" IN POROUS MEDIA. Tech. Note 315. *J. Petroleum Techn.*, 7, 53-56 (1955) November.

It is shown that in any isotropic porous medium there is a fixed ratio, $\Pi/4$, between the numerical values of the total pore perimeter per unit of cross-section and the specific surface area per unit of bulk volume. The consequences of this fact on the use of the concept "hydraulic radius" in the case of porous media are examined. The validity for consolidated sands of Kozeny's relationship and of the formula derived by Carman for capillary rise are discussed.
Author's Abstract

## Pipeline Control

Turner, E. B. PIPELINERS LIKE PUSH-BUTTON STATION CONTROL. *Oil Gas J.*, 54, 85-88 (1955) November 8.

Results of a comprehensive survey of oil pipeline operators show that 1) results with remotely supervised equipment are very good, and 2) use of push-button stations is increasing.

Author's Abstract

## Production

Bergman, W. E., Hurley, J. R., and Shell, F. J. NEW OIL WELL CEMENT BLEND. PART II. *World Oil*, 141, 150-56 (1955) November.

Further laboratory evidence of improved cement slurry characteristics is shown.

Authors' Abstract

## Reservoir Behavior

Crawford, P. B., England, A. C., Jr., Landrum, B. L., Haney, W. F., Jr. ESTIMATING SIZE AND SHAPE OF VERTICAL AND HORIZONTAL FRACTURES. T. P. 4128. *J. Petroleum Techn.*, 7, 175T-81T (1955) October.

A study was made by use of an electric analog to determine the effect of size and orientation of vertical and horizontal fractures on the shut-in pressures at wells surrounding the producing well. The pressure differences at the four surrounding wells are matched to a table of possible fracture combinations, from which size and orientation of the created fractures can be estimated. Tables and figures are included.

B. E. Eakin

Hawkins, M. F., Jr. MATERIAL BALANCES IN EXPANSION TYPE RESERVOIRS ABOVE BUBBLE POINT. Tech. Note 305. *J. Petroleum Tech.*, 7, 49-52 (1955) October.

One problem of reservoir engineering is the early estimation of reservoir pore volume from production figures. This note presents an extension of the material balance equation as applied to volumetric, unsaturated reservoirs being produced above the bubble point, by including correction for the presence and compressible nature of the interstitial water, as well as the compressibility of the oil and of the formation rock. The derivation of the equation is presented, and one example is included.

B. E. Eakin

Woods, R. W. CASE HISTORY OF RESERVOIR PERFORMANCE OF A HIGHLY VOLATILE TYPE OIL RESERVOIR. T. P. 4126. *J. Petroleum Techn.*, 7, 156T-159 (1955) October.

The case history of a highly volatile type oil reservoir which has been produced by pressure depletion is presented. Approximately 11 million bbls of stock tank oil has been produced from 10 wells in the 7500-acre field. Reservoir pressure has declined from 5,000 psi to about 1450 psi, with the gas/oil ratio increasing from 3200 to 23,000 cu ft/bbl. Pressure and fluid data are given.

B. E. Eakin

## Supply Auxiliaries

Reilly, J. PACIFIC NORTHWEST: PIPELINE RARITY. *Oil Gas J.*, 54, 118-21 (1955) October 10.

This unique organization has as sidelines to installing 1466 miles of pipeline to the northwest such projects as developing production which it hopes eventually will supply nearly all of the pipelines needs and prospecting for uranium (the ditch for the line was prospected as it was dug). Besides supplying gas to the last major gasless area in the U.S. the line will provide an outlet for present shut-in gas fields in the region, and provide the incentive for new exploration of this area for oil and gas.

B. E. Eakin

## Weather for Utilities

Iaccheo, A. R. CONSULTING METEOROLOGISTS MUST REGARD UTILITY PROBLEMS AS THEIR OWN. *Amer. Gas J.*, 182, 19 (1955) October.

A brief discussion of the requirements imposed upon consulting meteorologists in working with utility gas companies.

R. F. Bukacek

Trunk, E. F. HOW SPECIALIZED WEATHER FORECASTING IS USED FOR HIGH-EFFICIENCY GAS DISPATCHING. *Amer. Gas J.*, 182, 17-18 (1955) October.

A description of the method developed by Laclede Gas Company for distribution system send-out forecasting. A study of sendout characteristics demonstrated that atmospheric temperature, wind velocity and amount of sunlight are the principle variables, and it was found that

the daily sendout is a composite of four curves covering periods of unequal length. A suitable correlation of the variables in terms of the four basic curves was developed, and it was found necessary to obtain specialized weather forecasting services to implement their use.

R. F. Bukacek

### Well Injection

Reidel, J. C. SIMULTANEOUS GAS AND WATER INJECTION AT POZA RICA. *Oil Gas J.*, 54, 120-21, 123 (1955) November 7.

Bottom-hole pressure in Mexico's big Poza Rica reservoir is being maintained by simultaneous gas and water injection—50,000,000 cu. ft. of gas and 200,000 bbl. of water daily. This article gives the details. Author's Abstract

## 6. PETROLEUM AND SYNTHETIC LIQUID FUELS

### Cracking

Kalichevsky, V. A. REFINING TECHNOLOGY. THERMAL CRACKING AND REFORMING. PART IX. *Petroleum Eng.*, 27, C11-15 (1955) November.

These processes were the first to convert heavy hydrocarbons to those boiling in the gasoline range. A history and description is given of the two major types of cracking processes in commercial use: the "thermal" and the "catalytic" cracking processes. In the thermal cracking processes, the heavy oil fractions are decomposed by heating. Temperature, time, and pressure are the only conditions that affect the reactions. In the catalytic processes, the reactions are controlled additionally by the presence of a "catalyst". Catalysts influence the direction and rate of the reactions without taking part in them chemically, thus a small quantity of catalyst is theoretically capable of transforming an infinite quantity of material.

H. A. Dirksen

### Diesel Fuels and Lubes

RAILROAD DIESEL FUELS AND LUBRICANTS. *Lubrication*, 41, 121-132 (1955) November.

A discussion of present diesel engine lubricating practices is presented. Types of engine deposits and corrosion found in these engines is discussed at length. D. V. Kniebes

### Exploration

Strawinski, R. J. A MICROBIOLOGICAL METHOD OF PROSPECTING FOR OIL. *World Oil*, 141, 104-115 (1955) November.

The use of micro-organisms as indications of petroleum deposits appears to be sound. But samples taken must be representative of the given area for the results to have quantitative significance. A description is given of a quantitative microbiological procedure which can be used for the detection of hydrocarbon gases in subsoils. Author's Abstract

### Fischer-Tropsch Isomers

MacDonald, P., Sweett, F., and Hall, C. C. ISOMER DISTRIBUTION IN THE HYDROCARBON PRODUCTS OF THE FISCHER-TROPSCH SYNTHESIS. *J. Appl. Chem.* (British), 5, 536-41 (1955) October.

The isomer distribution in the $C_6$-hydrocarbons synthesized from carbon monoxide and hydrogen over iron and cobalt catalysts differs under different reaction conditions. The change in composition is attributed to be mainly an effect of reaction temperature, an increase in synthesis temperature causing a reduction in the proportion of the straight-chain hydrocarbons, and is not due to secondary isomerization of the initial reaction products as proposed by previous workers. K. C. Channabasappa

### Fluid Mapper

Cheek, R. E., Menzie, D. E. FLUID MAPPER MODEL STUDIES OF MOBILITY RATIO Tech. Note 316. *J. Petroleum Techn.* 7, 49-52 (1955) November.

The fluid mapper, a model relatively new to the petroleum industry, was used to study the effect of various mobility ratios on the areal sweepout efficiency for two typical spacing patterns. The experiments indicated the areal sweepout varied from 58.7 per cent at a mobility ratio of 0.089 to 92.0 per cent at a ratio of 24.8. The fluid mapper may prove useful to determine quickly the effective areal sweepout for any well spacing. Authors' Abstract

### Hydrogenation Review

Boyd, P. B., Jr. HYDROGENATION AND HYDROGENOLYSIS. *Ind. Eng. Chem.*, Part II, 47, 1883-91 (1955) September.

This is a comprehensive survey of the year's literature on hydrogenation, part of the eighth

annual review on Unit Processes. Fisher-Tropsch and "oxo" syntheses are covered. Petroleum, coal and related materials are represented with seventeen papers on desulfurization, seven on coal, and eight on residual oil improvement. Reactions of pure organic compounds, mechanism and catalyst studies are also well covered. A total of 293 references in eight categories are considered. E. B. Shultz

### Iranian Recovery

Swain, P. IRAN—A GIANT UNLIMBERING ITS MUSCLES. *Oil Gas J.*, 54, 86-87 (1955) November 7.

After one year of operation under the consortium agreement, the Iranian oil industry is approaching the position it occupied before nationalization. The international consortium is composed of five major American companies (7% interest each: Standard Oil Co., N. J.; Gulf Oil Corp.; The Texas Co.; Standard Oil Co. of Calif.; and Socony Mobil Oil Co., Inc.); nine additional American companies, (5% total); British Petroleum Co., (40%); a Dutch company, (14%); and a French company, (6%). A. J. Tulis

### Waste Disposal

Anderson, C. O. and Gardner, K. L. HERE'S A MODEL WASTE-DISPOSAL SYSTEM. *Oil Gas J.*, 54, 75-77 (1955) October 31.

One of the most advanced waste-disposal systems in the industry, serving a 14,800 bbl per day refinery, is described. D. M. Mason

## 7. ANALYTICAL METHODS AND TESTS

### Carbon Method

Pickhardt, W. P., Oemler, A. N., and Mitchell, J., Jr. DETERMINATION OF TOTAL CARBON IN ORGANIC MATERIALS BY A WET-DRY COMBUSTION METHOD. *Anal. Chem.*, 27, 1784-88 (1955) November.

An improved simple and rapid wet-dry combustion method has been developed for estimating small amounts of organic matter in water. Provisions have been made for analyses of aqueous samples containing high-boiling, steam-distillable, or volatile substances. There is no interference from halogens. Solids or liquids up to 100 ml. in volume containing organic matter equivalent to 1 to 150 mg. of carbon dioxide are taken for analysis. As little as 0.5 mg. of carbon per 100 ml. of water can be determined with a precision and accuracy within 1% relative. Authors' Abstract

### Carbon-Hydrogen

Belcher, R., Fildes, J. E. and Nutten, A. J. THE MICRO-DETERMINATION OF CARBON AND HYDROGEN IN ORGANIC COMPOUNDS CONTAINING PHOSPHORUS. *Anal. Chim. Acta*, 13, 431-36 (1955) November.

Several reagents have been examined for use in the micro-determination of carbon and hydrogen in organic compounds containing phosphorus for which low carbon values had previously been reported. Tungstic oxide was found to be the most convenient reagent for this purpose. A modification of the procedure of Friedrich was used throughout this investigation which is suitable for universal application.
Authors' Abstract

### Coal Ash

Myhill, A. R. ASH AND INORGANIC MATERIAL IN COAL. *Gas J.* (British), 284, 457-58, 63, 64 (1955) November 16.

The composition and source of the ash-forming matter in coal, the composition of the ash, the effect of ash on the industrial uses of coal, the formation of clinker and deposition of ash in flues, and the significance of laboratory tests are discussed. D. M. Mason

### Coal X-Rays

Dryden, I. G. CHEMICAL INTERPRETATION OF X-RAY STUDIES OF THE ULTRAFINE STRUCTURE OF COAL. *Fuel* (British), 34, S29-35 (1955) April (Suppl.)

Detailed X-ray studies of coal by X-ray diffraction and infra-red spectroscopy have provided a general picture of a nucleus containing fused aromatic rings with aliphatic substituents. The size of this aromatic nucleus has been evaluated by various methods based on the fraction of carbon that occurs in aromatic form. The role of oxygen in linking the nuclei is discussed.
K. C. Channabasappa

### Coulometry

Gerhardt, G. E., Lawrence, H. C., and Parsons, J. S. PRECISION COULOMETRIC TITRA-

TOR. *Anal. Chem.*, 27, 1752-54 (1955) November.
An instrument for carrying out coulometric titrations in an industrial laboratory within 0.1% precision and accuracy gives constant currents up to 450 ma. The electric time clock is operated by a frequency standard, so that the instrument can be used on industrial power systems where the frequency is not rigidly controlled. Authors' Abstract

### Differential Thermal Analysis

Nelson, J. B. DIFFERENTIAL THERMAL ANALYSIS AND ITS APPLICATIONS TO FUEL SCIENCE AND TECHNOLOGY. *British Coal Utilis. Res. Assoc. Monthly Bull.*, 19, 502-531; (BCURA Review No. 152); (1955) September/October.
The history and description of differential thermal analysis is reviewed. This application in tracing the physico-chemical changes that take place when organic and inorganic substances like coal, quartz and clay are subjected to thermal treatment is discussed. Differential thermal analysis curves also serve as a means of differentiating ranks of coal, types of quartz, and species of clay. K. C. Channabasappa

### Sulfide-Ion

Kivalo, P. COMPLEXOMETRIC DETERMINATION OF SULFIDE. *Anal. Chem.*, 27, 1809 (1955) November.
A complexometric method for the determination of sulfide ion is described. The method is based on the observation that an alkaline sulfide solution added to a neutral or slightly acid solution containing an excess of metal perchlorate gives a stoichiometric precipitate with copper. Sulfide and thiosulfate do not interfere.
D. M. Mason

### Tetrathionate Method

Nietzel, O. A. and Desesa, M. A. SPECTROPHOTOMETRIC DETERMINATION OF TETRATHIONATE. *Anal. Chem.*, 27, 1839-41 (1955) November.
The spectrophotometric method of Robinson for the determination of tetrathionate has been modified to yield greater sensitivity and accuracy. The procedure depends on the production of thiocyanate equivalent to the tetrathionate and determination of thiocyanate with an excess of ferric iron. By developing the color in opaque cylinders, the rapid decomposition of the ferric thiocyanate color is eliminated. The use of ferric nitrate and nitric acid instead of ferric chloride and hydrochloric acid has decreased the absorbence of the reagent blanks. By measuring the final color at 460 millimicrons instead of at 525 millimicrons a twofold increase in sensitivity has been achieved.
Authors' Abstract

## 8. GENERAL AND PHYSICAL CHEMISTRY

### Activity Coefficients

Elrod, H. G., Jr. AN ACCURATE SIMPLE FORMULA FOR THE ACTIVITY COEFFICIENT OF VAPORS. *Ind. Eng. Chem.*, 47, 2199-2200 (1955) October.
The approximation $f/p = (2-pV/RT)^{-1}$ applicable to vapors at all temperatures and at pressures below the critical pressure is presented with its derivation and a table showing its accuracy. R. F. Bukacek

### Diffusion

Carmichael, L. T., Reamer, H. H., Sage, B. H., and Lacey, W. N. DIFFUSION COEFFICIENTS IN HYDROCARBON SYSTEMS: n-HEPTANE IN GAS PHASE OF METHANE-n-HEPTANE SYSTEM. *Ind. Eng. Chem.*, 47, 2205-10 (1955) October.
The Maxwell diffusion coefficients for n-heptane in the gas phase of the methane-n-heptane system were measured at temperatures from 100° to 220° F. and at pressures from 14 to 60 psia. The experimental equipment, procedure, and results are presented. B. E. Eakin

### Heat Capacity

Johnson, A. I. and Huang, C. J. ESTIMATION OF THE HEAT CAPACITIES OF ORGANIC LIQUIDS. *Can. J. Techn.*, 33, 421-25 (1955) November.
A method of estimating heat capacities of organic liquids at 20° C. based on the addition of group heat capacities is suggested. The group contributions were estimated for the most part from the data summarized by Chow and Bright. The method compares favorably with the correlation of Chow and Bright, being easier to apply and only slightly less accurate. The accuracy of the proposed method is much greater than that possible by assuming the atomic heat capacities suggested by Wenner.
Authors' Abstract

### Humidity Controls

Richardson, G. M. and Malthus, R. C. SALTS FOR STATIC CONTROL OF HUMIDITY AT RELATIVELY LOW LEVELS. *J. Appl. Chem.* (British), 5, 557-66 (1955) October.

A report on an investigation of saturated salt solutions and paired salt hydrates in respect to their use in humidity control in a closed space. Experimental results are presented and the difficulties encountered in using paired salt hydrates to control humidity at low levels are described. R. F. Bukacek

### Phase Equilibria

Hogan, R. J., Nelson, W. T., Hanson, G. H., and Cines, M. R. ETHANE-ETHYLENE-ACETYLENE SYSTEM: VAPOR-LIQUID EQUILIBRIUM DATA AT —35°, 0°, AND 40° F. *Ind. Eng. Chem.*, 47, 2210-15 (1955) October.

The experimental equipment, procedures, and data are presented for the phase equilibria measurements of the three $C^2$ hydrocarbons. Data were obtained for this ternary system at —35°, 0°, and 40° F., and pressures of 150 to 465 psia. Experimental equilibrium-volatility ratios and ternary equilibrium diagrams are included. B. E. Eakin

### Thermometer

Barber, C. R. A PLATINUM RESISTANCE THERMOMETER FOR USE AT LOW TEMPERATURE. *J. Sci. Instruments* (British), 32, 416-21 (1955) November.

A platinum resistance thermometer of external dimensions 75 x 2.5 mm suitable for use at low temperatures is described. The resistance coil is sealed in a thin-walled platinum sheath in an atmosphere of helium by means of a lead glass-to-platinum seal. The reproducibility of reading is shown to be ± 0.001° C. at the ice point after a number of temperature cycles down to a —260° C. over a period of 16 months. Authors' Abstract

### Thiophene Properties

Hubbard, W. N., Scott, D. W., Frow, F. R. and Waddington, G. THIOPHENE: HEAT OF COMBUSTION AND CHEMICAL THERMODYNAMIC PROPERTIES. *J. Amer. Chem. Soc.*, 77, 5855-62 (1955) November 20.

The heat of combustion of thiophene was redetermined using a rotating bomb. Heat and free energy of formation as a function of temperature have been calculated from this more reliable value. D. M. Mason

## 9. ORGANIC CHEMISTRY

### Eastern Chemicals

TITANIC BOOM ON TIDEWATER BASE. *Chem. Week*, 77, 21-24 (1955) November 26.

Philadelphia—long-ago supply point for 'vitriol' and whale oil—is more than holding its own as a major source of chemical and oil products. In the heart of the eastern seaboard's greatest concentration of chemical industry, Philadelphia has two big assets making it worthwhile for these firms to keep expending their operations here: mass market and seagoing shipping. Editor's Abstract

### Tar Acids

Blackburn, W. H., Barker, L., Catchpole, J. R., and Hollingworth, N. W. AN INVESTIGATION INTO THE COMPOSITION OF AMMONIACAL LIQUOR. I (CONTINUED) CONTINUOUS VERTICAL RETORT LIQUOR. Gas Council (British) Research Commun. GC24 (1955) November, 101 pp. London; *Gas World* (British), 142, 1387-88 (1955) November 28.

Continuing the first report dealing with monohydric phenols in vertical retort liquor (GC17, see *Gas Abs.* 11, 49 (1955), March), this paper discusses polyhydric phenols and heavier organic content separated from the methyl isobutyl ketone extract of the liquor. Fractionation at 50 mm Hg yielded narrow-range fractions containing catechol, resorcinol, quinol, and their methyl and dimethyl derivatives. These compounds were identified by chromatography on paper and separated on silica gel columns. Estimation of the components was made by ultraviolet spectrophotometry, which required synthesis of a number of the pure methyl compounds not commercially obtainable. In the 5800-gram fraction, 20 compounds were separated, in addition to residues of dihydric and higher phenols, and pitches. Detailed discussion of the technique, and a 119-item bibliography are given. O. P. Brysch

Golumbic, C. (assigned to the United States of America) METHOD FOR THE RECOVERY OF TAR ACIDS BY EXTRACTION IN THE PRESENCE OF AN ALKALI SOLUBLE HYDROSULFITE. U. S. 2,724,001 (1955) November 15.

This patent describes a method for recovering tar acids from the products of low temperature carbonization and coal hydrogenation by extracting the above products with an aqueous caustic solution containing from 0.2-3% of a compound selected from the group consisting of the hydrosulfites of sodium, potassium and ammonium, acidifying the caustic solution with a weak mineral acid, and extracting the resulting solution with ether. K. C. Channabasappa

# 10. CHEMICAL ENGINEERING

## Automation

Young, A. S. PREREQUISITES OF THE AUTOMATIC CHEMICAL FACTORY. *Can. Chem. Processing*, 39, 99, 100, 102, 103, 106 (1955) September.

This paper discusses the possibilities and problems of automation in the chemical industries. Prerequisites to an economical, completely automatic chemical factory are: calculation of dynamic characteristics of plant units and of the process; development of control-system design technique to deal with an "integrated system," (several separate control linkages to form a simple multi-loop system); and development of control equipment, in particular a "master controller" that receives measurement signals, operates on them according to a prescribed program, and sends out command signals.

A. J. Tulis

Ziegler, J. G. CASCADE CONTROL SYSTEMS. *Can. Chem. Processing*, 39, 102,4,6,10,11 (1955) October.

The application of cascade control systems to a number of processes is discussed. Cascade control requires the use of at least two controllers interconnected, with one varying the set point at which the other controls. One or more secondary controllers which measure and control a second quantity may be used in the system. Purposes of a cascade control system are: 1) Maintain a desired relationship between variables; 2) Accurately limit a secondary variable; 3) Reduce load changes; 4) Reduce effective time lag in control circuit. E. J. Pyrcioch

## Column Design

Cairns, R. C. and Roper, G. H. UNI-DIRECTIONAL HEAT AND MASS TRANSFER AT HIGH HUMIDITIES IN A WETTED-WALL COLUMN. *Chem. Eng. Sci.*, 4, 221-28 (1955) October.

Simultaneous and adiabatic heat and mass transfer at high humidities were studied. The experimental data were found to deviate from the equation of Chilton and Colburn, and Colburn and Drew. A correlation is presented involving the ratio of the net sensible heat carrier by the diffusing vapor to the heat transferred in the absence of mass transfer.

R. F. Bukacek

## Dust Removal

Stairmand, C. J., and Kelsey, R. M. THE ROLE OF THE CYCLONE IN REDUCING ATMOSPHERIC POLLUTION. *Chem. and Ind.* (British), No. 42, 1324-30 (1955) October 15.

The application of certain cyclone type dust collectors is discussed for the removal of fine dusts and coarser particles from plant effluents. Types of cyclones considered are: the scroll- or shutter-type collector; the high-efficiency cyclone used in groups, and the multicyclone, comprising a large number of small elements. Examples are given for predicting cyclone performance using grade efficiency curves and size analyses of the inlet ducts. E. J. Pyrcioch

## Fluid Flow

DeCraene, E. P. NEW TEST DATA SIMPLIFIES FLUID FLOW PROBLEMS. *Heating, Piping and Air Cond.*, 27, 90-95 (1955) October.

New values for resistance to flow for valves and fittings are presented, with various charts and illustrative calculations. R. F. Bukacek

Maker, F. L. HOW TO CALCULATE FLASH-FLOW PRESSURE DROP IN HEATERS. *Petroleum Ref.*, 34, 140-52 (1955) November.

A simple, graphical method is presented for handling the completed two-phase flow pressure-drop calculations which occur in flash heaters.

W. G. Bair

## Gas Scrubbing

Doyle, H. (assigned to The Consolidated Mining and Smelting Co.) METHOD OF TREATING GASES. U. S. 2,720,280 (1955) October 11.

In washing gases to remove dust using a liquid-bath type of scrubber, gases (such as $SO_2$) are sometimes physically absorbed by the bath liquid. Such physically absorbed gases may conveniently be removed from the bath liquid by contacting the liquid with air or other gas in one or more scrubbers of the liquid-bath type.
D. M. Mason

## Material Handling

Smith, J. C. DESIGN A HOPPER THAT WON'T ARCH. *Chem. Eng.*, 62, 167-72 (1955) September.

Equations are presented for calculating the base pressure in circular bins having sloping sides and their application to design for handling flowing granular solids is discussed.
E. J. Pyrcioch

## Numerical Integration

Gidley, J. L. and Rase, H. F. NUMERICAL INTEGRATION: A TOOL FOR CHEMICAL ENGINEERS. *J. Chem. Education*, 32, 535-38 (1955) October.

In chemical engineering, definite integrals of complicated functions are usually evaluated by the graphical method. Paper shows that, however, the use of numerical methods requires less time and frequently is more accurate. The application of Simpson's and Weddle's rules to a typical chemical engineering problem is given as an example.
S. Hu

## Pressure Vessels

Raun, M. A. PLASTICS PRESSURE VESSELS. *Materials and Methods*, 42, 107-10 (1955) October.

The results of preliminary studies of spherical and cylindrical plastic pressure vessels carried out as a Chemical Corps. development program are tabulated and discussed. The spheres tested consisted of glass reinforced polyester plastic.
G. G. Wilson

## Reactor Design

Corrigan, T. E. and Young, E. F. CHEMICAL ENGINEERING FUNDAMENTALS — GENERAL CONSIDERATIONS IN REACTOR DESIGN. *Chem. Eng.*, 62, 211-14 (1955) October. This is one of a series on applied kinetics and reactor design. Types of reactions and how they affect the design are considered in this installment. The effects of temperature and pressure upon conversion are shown for several orders of reaction. Equations are given for both backmixing and longitudinal reactors for comparison.
E. B. Shultz

Goins, R. R. (assigned to Phillips Petroleum Co.) MEANS AND METHOD FOR CONVERTING HYDROCARBONS. U. S. 2,719,873 (1955) October 4.

This invention relates to pebble heater apparatus, specifically to improved sealing means at the pebble inlet and outlet of a pebble reaction chamber. It comprises introducing an inert sealing gas such as steam into the pebble throats in a manner such that thermal shock of the pebbles is materially reduced. The enlargement of the cross section in one portion of the pebble throat causes the pebbles flowing along the periphery of that section to gravitate at a considerably lower rate than those through the axial portion. The pebbles flowing at a lower rate give up more heat to the sealing gas and the outer layer is considerably cooler. Thus the peripheral pebble portion is at such a temperature that thermal shock thereof is substantially obviated, and the sealing gas is substantially preheated.
Inventor's Abstract

## Soil Properties

Lambe, T. W. CIVIL ENGINEERING NEED FOR SOIL CHEMICALS. *Ind. Eng. Chem.*, 47, 2234-39 (1955) November.

Chemical additions are needed to improve soil properties for selected construction purposes. Much research has been done but present methods need improvement and they are costly.
W. G. Bair

## Waste Disposal

Jenkins, S. H. THE DISCHARGE OF TRADE EFFLUENTS TO SEWAGE PURIFICATION WORKS. *Chem. and Ind.* (British) No. 39, 1204-07 (1955) September 24.

Considerations affecting the acceptance of trade wastes by municipal sewage plants, including safety, blockage of sewers, and effect on biological sewage are discussed.
D. M. Mason

Southgate, B. A. WATER POLLUTION. *Chem. and Ind.* (British) No. 39, 1194-99 (1955) September 24.

In this introduction to a symposium the author discusses test methods and standards in relation to the effect of discharges into fresh water streams. Variables affecting toxicity of effluents to fish, and considerations relating to BOD are given particular attention.

D. M. Mason

## 11. PROCESS EQUIPMENT AND INSTRUMENTATION

### Air Compressors

Morris, J. T. and Ramsey, R. T. WHAT EVERY CONTRACTOR SHOULD KNOW ABOUT COMPRESSORS FOR AIR DRILLING (PART I). *World Oil*, 141, 119-21, 132 (1955) November.

This first part of series describing the types of compressors available today and an explanation of how their size, capacity, number of stages, type of power drive and horsepower requirements contribute to the success of air drilling.

Authors' Abstract

### Corrosives Handling

Linford, A. THE METERING OF DIFFICULT AND INJURIOUS FLUIDS. *Coke and Gas* (British), 17, 402-06 (1955) October.

The author discusses the techniques of metering and the problems encountered in the flow of corrosive and similar fluids by differential pressure means.

S. Volchko

### Gas Analyzers

Swain, R. R. and Hays, J. A. GAS ANALYSIS IN STEEL MILLS. *Instr. and Autom.*, 28, 1940-44 (1955) November.

The applications of automatic carbon dioxide, oxygen, and combustibles analysers to steel mill operations are described.

D. V. Kniebes

### Hydraulic Balance

Haller, W. K. and Calcamuggio, G. L. APPARATUS FOR THE MEASUREMENT OF EXTREMELY SMALL WEIGHT, VOLUME, AND DENSITY CHANGES. *Rev. Sci. Instruments*, 26, 1064-68 (1955) November.

A pressure-controlled hydraulic balance for the measurement of extremely small weight, volume, and density changes has been developed. The movement of a calibrated pressure-sensitive glass float, carrying the sample, is observed while the pressure on the float is adjusted until equilibrium of the forces is reached and movement ceases. Changes in weight or volume of the sample or in the density of the liquid result in forces compensated for by a corresponding pressure adjustment, from which the magnitude of the changes can be calculated. Applied to the study of a rate process, it has been possible to measure continuously the weight loss of silicate glasses due to corrosion in distilled water with an accuracy of 0.0003% of 3-gram total sample weight.

Authors' Abstract

### Hydrogen Indicator

Perkowitz, L. P. CONTINUOUS DETECTION OF HYDROGEN OR HYDROGENOUS MATERIALS IN GASES. *Anal. Chem.*, 27, 1805 (1955) November.

This paper describes an instrument based on the dew point principle for the continuous detection of low concentrations of hydrogen or hydrogenous materials in the inert blanket gases required with liquid alkali metal coolants. A sensitivity of 0.001 volume % of hydrogen is claimed.

Author's Abstract

### Piping Problems

Chen, L. H. PIPING STRESS ANALYSIS IS APPLIED TO NUMERICAL METHODS. *Petroleum Eng.*, 27, C40, 42, 44, 46 (1955) October.

The use of the Hardy Cross method in calculating expansion stresses in high temperature piping is described and illustrated with example calculations.

R. F. Bukacek

Hsiao, K. H. NEW METHOD FOR PIPE STRESSES. PART I. HOW TO USE THE TABULAR METHOD. *Petroleum Refiner*, 34, 157-62 (1955) October.

Describes the quick method of computing stresses in three dimensional piping systems. Part one of a three part series.

G. G. Wilson

Schuster, E. C. and Rupe, V. L. GETTING THE MOST FOR YOUR FLANGE DOLLAR USING "O" RINGS. *Pipe Line Ind.*, 3, 22-25 (1955) October.

The results of hydrostatic testing of 300 ASA

flat-face flanges with O-ring seals are presented. They indicate that an ASA 300 raised or flat-face joint 12 inches and under in size can be given a cold-pressure rating equal to the ASA 600 ring joint flange. G. G. Wilson

PIPING FOR INDUSTRIAL GASES. *Air Conditioning, Heating and Ventil.*, 52, 69-76 (1955) November.

This article covers in detail construction features and design considerations for plant piping system for nitrogen, oxygen, acetylene, and argon. W. G. Bair

### Ultrasonic Flowmeter

Kritz, J. ULTRASONIC FLOWMETER. *Instr. and Autom.*, 28, 1912-13 (1955) November.

An ultrasonic flowmeter is described which measures flow rate and the mass rate of a fluid and is unaffected by such variables as temperature, pressure, viscosity, solids and suspension or position in installation. D. V. Kniebes

## 12. MATERIALS OF CONSTRUCTION

### Cathodic Protection

Markle, M. G. HOW NORTHERN ILLINOIS PROTECTS ITS DISTRIBUTION SYSTEM. *Gas*, 31, 99-101, 04, 06, 08, 10, 12, 14 (1955) October.

A survey of cathodic protection procedures in use by the Northern Illinois Gas Company, a large gas distribution company serving 480,000 customers; includes diagrams of standards for cathodic protection installations. G. G. Wilson

Meany, J. J., Jr. CATHODIC PROTECTION OF TANK BOTTOMS. *Oil Gas J.*, 54, 95-96, 98, 100 (1955) October 24.

The pre-construction and installation of a cathodic protection system to protect the bottom of oil tanks in a gas production plant is described. The design was complicated by stray current effects and cinder fill, and the undesirability of electrically insulating the tanks. The basic instrumentation used in determining current requirements was based on the Pearson mill type measurement, and utilized reference electrodes installed at pertinent locations under the tank during construction. G. G. Wilson

Titterington, Y. W. WHAT SIZE ANODES SHOULD YOU USE? *Pipe Line News*, 27, 49-50 (1955) November.

An analysis of the effect of anode size, shape, and composition on the economics of cathodic protection by use of magnesium anodes. G. G. Wilson

### Coatings

Gally, S. K. and Lee, C. E. "BOOT" WRAP FOR SERVICE TEES DEVISED BY SOCAL ENGINEERS. *Gas*, 31, 88-9 (1955) October.

The use of one piece flexible "boots" constructed of vinyl material to facilitate the coating of irregular fittings with plastic tape is described and illustrated. G. G. Wilson

### Corrosion

Akimov, G. W. ELECTRODE POTENTIALS. PART 1 OF 2 PARTS. *Corrosion*, 11, 477t-86 (1955) November.

The theory of reversible and irreversible electrode potentials is considered in detail. The effect of such factors as stress, temperature, velocity of solution, time, and electrolyte composition on electrode potentials actually encountered in a practical case are discussed. G. G. Wilson

Ewing, S. P. ELECTROCHEMICAL STUDIES OF THE HYDROGEN SULFIDE CORROSION MECHANISM. *Corrosion*, 11, 497t-501 (1955) November.

A statement of the anodic and cathodic reactions in the hydrogen sulfide corrosion process is given along with experimental evidence to indicate that these reactions are the important ones. The corrosion process is explained further in terms of the electro-chemical properties of the corroding solution and the corrosion products. Results of laboratory experiments indicate that the description of the mechanism is correct. The possible usefulness of an understanding of the corrosion process is demonstrated by a few practical applications. Author's Abstract

Updegraff, D. M. MICROBIOLOGICAL CORROSION OF IRON AND STEEL. *Corrosion*, 11, t442-46 (1955) October.

A critical review of the literature on microbiological factors involved in the corrosion of iron and steel. Examples of the six general

mechanisms by which organisms can influence corrosion are given and methods used to prevent microbiological corrosion are outlined. Includes 21-item bibliography. G. G. Wilson

## Corrosion Meter

Marsh, G. A. and Schaschl, E. HERE'S PURE'S NEW CORROSION METER. *Oil Gas J.*, **54**, 135-41 (1955) November 21.

A new type of probe and measuring procedure for use in establishing rates of corrosion is described. This procedure is based on the use of a Wheatstone bridge circuit to measure the electrical resistance of the corroding specimen in the test probe. The circuit used is temperature compensating, and measurements are obtained with the probe in place in the corrosive environment under test. Corrosion rate data obtained from corrosion tests on ship tanks in an oil tanker are presented. This corrosion meter was recently developed in the laboratories of the Pure Oil Co. G. G. Wilson

## Ductile Iron

Ernst, C. E., Adair, R. V. and Cox, G. L. FLAME HARDENED DUCTILE IRONS. *Materials and Methods*, **42**, 106-09 (1955) November.

Recommended commercial procedures are outlined for flame hardening of ductile iron parts up to Rockwell C64 surface hardness for improved wear resistance. E. J. Pyrcioch

Grandpierre, M. and Reynolds, C. C. DUCTILE IRON—A NEW MATERIAL FOR PETROLEUM PIPE. *Oil Gas J.*, **54**, 192-94, 97 (1955) November 21.

The mechanical properties and corrosion resistance of ductile iron is presented. This material is produced by adding magnesium and/or cerium to liquid cast iron to cause the graphite to precipitate as spherulites instead of flakes. Pipe constructed of this material has been used in France as reheater coils for tankers, and to transport crude refinery gas at a pressure of 425 psi. G. G. Wilson

## Inhibitors

Pollard, W. R. and Lawson, J. V. A PILOT PLANT FOR STUDYING CORROSION RATES. *Ind. Eng. Chem.*, **47**, 2282-83 (1955) November.

The use of a pilot plant still consisting of an evaporator, stripper, condensor, cooler, and condensate and recycle drums to evaluate corrosion inhibitors for a refinery is described. G. G. Wilson

Greenwell, H. E., Loncaric, R. and Byars, H. G. USE OF AMMONIA TO PREVENT CASING CORROSION. *Corrosion*, **11**, 491t-96 (1955) November.

The theorectical chemical equilibria involved in the use of ammonia as an inhibitor in the liquid phase of an oil well, and the results of laboratory and field tests of ammonia as an inhibitor for prevention of vapor space casing corrosion are presented. The authors state that these tests proved conclusively that ammonia will penetrate below the zones of most corrosion in the casing. G. G. Wilson

## Metal Failure

Resen, F. L. WHY DID THOSE STORAGE VESSELS FAIL? *Oil Gas J.*,**54**, 89-94 (1955) October 24.

The last in a series of four articles is describing metallurgical studies of the regenerated catalyst hopper and spent catalyst vessels of a fluid catalytic cracking unit. The studies were initiated as a result of failure of the vessels after served years of operation and their purpose was to determine the cause of failure. The tests conducted as described and results are presented as tabulations of data and metallographic illustrations. G. G. Wilson

## Protective Painting

Dechaux, G. THE PROTECTION OF STRUCTURAL STEEL—PRINCIPLES OF PROTECTIVE PAINTING. *Chem. and Ind.* (British), No. 48, 1535-41 (1955) November 26.

The principles involved in the corrosion of painted structures are developed and applied as a guide to the formulation of anticorrosive paints. Methods of appraising the efficiency of anti-corrosive paints are also discussed. G. G. Wilson

Fancutt, F. THE PROTECTION OF STRUCTURAL STEEL. *Chem. and Ind.* (British) No.

47, 1492-1502 (1955) November 19.

The experience of British Railways with various methods of surface preparation of steel structures prior to painting is outlined and a detailed discussion of the code of Practice cleaning and painting of bridges, buildings, and structures recently issued by the British Transport Commission is given. This code covers acceptable methods of surface preparation and recommended painting procedures for various railway structure. G. G. Wilson

Hoffman, E. L. PAINT STORAGE TANKS WHITE—AND SAVE. *Oil Gas J.*, 54, 241-53 (1955) November 21.

A discussion of the use of self cleansing white paint in reducing evaporation losses of tanks containing volatile petroleum products. Data on the effect of paint color on evaporation losses is reviewed, and the advantages to be gained by painting various types of tanks are discussed. Includes 25 item bibliography. G. G. Wilson

### Refractory Performance

Haffner, A. E. LENGTH OF SERVICE LIFE OF REFRACTORIES IN CARBONISING PLANT IN THE BRITISH INDUSTRY. International Gas Union, Paper IGU/25-55 6th Conference, New York, (1955) September 26-30; *Gas World* (British), 142, Coking Section, 67-80 (1955) October 1; *Gas J.* (British) 284, 194-8 (1955) Oct. 19.

About 200,000 tons per year of refractories are supplied to the British carbonizing industry. This represents replacement and repairs on about 1.3 million tons of installed refractories in the gas and coking industries. Because of expense there has been much effort to improve the life service of refractories. A review of performance is given, covering the principal carbonizing systems — horizontals, continuous verticals, intermittent verticals and coke ovens, and illustrations of damage due to slag, scurf, flaking and cracking are included. Increase in the use of silica and improved structural design has resulted in generally improved service life of the plant. The Joint Refractory Materials Committee continues this survey and research on quality control of refractories.

O. P. Brysch

## 13. NEW BOOKS

### Absorption Refrigeration

Altenkirch, E. ABSORPTIONS-KAELTE-MASCHINEN (ABSORPTION REFRIGERATION MACHINES). Veb Verlag Technik, Berlin, 1954, 172 pp, 103 figs. (in German).

This book is written by the late Dr. Altenkirch, an authority on absorption refrigeration. The book covers all the important aspects of the field and illustrates methods of calculation of various quantities associated with the operation of an absorption refrigerator. Some emphasis is placed on the use of the Merkel-Bosnjakovic heat content diagram in the solution of absorption problems. J. F. Reed

### Chemical Industry

American Chemical Society. LITERATURE RESOURCES FOR CHEMICAL PROCESS INDUSTRIES. ACS. Washington, 1954. (Advances in Chemistry series #10).

### Gas and Oil

American Institute of Mining and Metallurgical Engineers. STATISTICS OF OIL AND GAS DEVELOPMENT AND PRODUCTION. Vol. 8. AIMME. New York. 1953.

Ewing, G. W. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS. McGraw-Hill Book Co., Inc., New York, 1954.

Ferris, S. W. HANDBOOK OF HYDROCARBONS. Academic Press Inc., New York. 1955. Hydrocarbons are tabulated,—first, by boiling point, then by empirical formula, alternate names, and cyclic arrangement, with 752 references.

### Piping

American Society of Mechanical Engineers. AMERICAN STANDARD CODE FOR PRESSURE PIPING ASA B31.1-1955. Amer. Soc. Mech. Eng., New York. 136 pp. $4.00 (1955). Sections 1-7 of the ASA B31.1-1955 code; the sections are: 1) Power Piping systems. 2) Industrial Gas and Air Piping systems; 3) Refinery and Oil Transportation Piping systems; 4) District Heating Piping systems; 5) Refrigeration Piping systems; 6) Fabrication Details; 7) Materials — their specifications and identification. R. F. Bukacek

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American Chemical Society. Journal
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Australian Journal of Applied Science
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Gas Heat
Gas Journal
Gas Times
Gas und Wasserfach
Gas World

Heating, Piping and Air Conditioning

Independent Petroleum Association of America Monthly
Industrial and Engineering Chemistry
Industrial Finishing
Industrial Gas (American)
Industrial Gas (British)
Industrial Heating
Institute of Fuel (British). Journal
Institute of Gas Technology Publications
Institute of Petroleum (British). Journal
Institution of Gas Engineers. Bulletins, Communications and Transactions
Instruments

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Journal des Usines a Gaz
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National Advisory Committee for Aeronautics, Reports
National Fire Protection Association Quarterly
National Gas Bulletin of Australia
National Petroleum News

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